

ENTOPATH NEWS

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REMINDER!!!

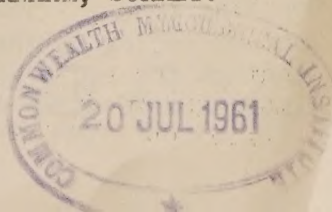
Specimens and Descriptions to be sent direct to either the Pathologist or the Entomologist, the minute preferably being in the package with the material. Wherever possible specimens should be packed in polythene bags.

A copy of the minute and all subsequent correspondence to go via your Conservator.

Pathologist	:	FOREST RESEARCH STATION,
		ALICE HOLT LODGE,
Entomologist	:	WRECCLESHAM,
		FARNHAM, SURREY.

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INTRODUCTION

The most notable feature in forest growth since our last number has been the occurrence of the sharp and extremely late frosts in the last week in May. Serious damage to susceptible hardwoods has been reported from all parts of the country and from some localities considerable damage on large sycamores has even been reported. With conifers, probably most damage was incurred by Sitka and Norway spruce, but severe damage to Tsuga and Douglas Fir also occurred. The pines, mostly Corsican, were also damaged in certain localities. A few records of some damage to Scots and Lodgepole pines have been received.

The frost was so general, and the damage so obvious, that diagnosis has been quite straightforward. However, this year Neomyzaphis is rampant and on spruces where heavy infestation has occurred in conjunction with frost damage to the current years shoots, the relative importance of these two factors in terms of the effect on future growth is difficult to determine.

The most extraordinary feature of the frosts was the unpredictable local distribution of damage. Over most of the country radiation frost occurred but in some parts air frost accounted for most of the damage. This would seem to account for anomalies such as large trees being damaged throughout the crown with ground vegetation comparatively unaffected.

Before letting you get to the meat of this issue, we should like to draw your attention to an addition to the regular Reminder which appears on the front page. Many specimens are still sent to us carefully packed in the best way to ensure maximum dessication of the material. This often makes examination at Alice Holt extremely difficult and we should like to make a strong plea for specimens to be sent in closed polythene bags whenever this is practicable.

TUSHING DAMAGE IN CONIFER PLANTATIONS

Damage to the bole and to exposed roots during the extraction of thinning produce is a common occurrence to which too little thought has been given in this country. In many forests, particularly on hillsides, the damage is strikingly bad, and often unnecessarily so. The pathologists are interested in this damage as a direct source of entry of rot-causing fungi. These may cause deterioration not only around the scar, but extending up the stem causing considerable loss of produce, and also through the roots producing effects on growth and stability and causing infection of other trees. Damage to stumps and stump roots is not

considered here, though it is important as a cause of failure of creosote stump protection against Fomes annosus. This we are looking at separately.

We have been investigating the problem of infection through extraction wounds and we think that some of our preliminary findings might be of interest. First of all it is clear that rot damage will increase with time, and with F.C. plantings most of the damage is of relatively recent occurrence. It is when our crops are older, when rot has developed from wounds caused twenty or thirty years before, that the worst losses may be expected. Of course it is possible to remove many of the previously wounded trees during thinning operations. In practice, after the early thinnings, particularly where there are many wounded trees, this is not so easy. In addition, root wounds tend to be overlooked. At present rot loss is not severe and the results of our investigations so far are somewhat re-assuring. However it remains potentially serious, and findings in other countries, where this matter is of longer standing and has been well-investigated, confirm this view. In North America it is common to cull whole trees because of previous damage and in many areas a badly scarred tree is almost always seriously decayed as a result.

There are many variable factors, quite apart from availability of fungal spores, such as thickness of bark, depth of rooting and varying susceptibility to rot infection of the tree species, or individuals concerned. The age and size of the crop is important, and especially so the size of the wounds. The method of extraction is very important, for example, whether the butts are raised from the ground, and whether extraction is by wheeled or tracked tractor or by horse. With horses we have noticed that where only selected trees are brashed, the horse tends to avoid the unbrashed trees and make for the gaps left clear by brashing, so that to a large extent it is the selected trees which tend to receive the worst damage in the early thinnings. Since tracks once made tend to be followed, the same trees tend to be repeatedly damaged in successive thinnings. From the Pathologist's viewpoint, quite apart from other working considerations, leaving trees unbrashed seems of doubtful economic advantage. If the trees are not worth brashing they are probably best removed as a non-commercial pre-thinning.

In general the total surface area of damage to stems is about twice that to roots, though with spruce with its exposed surface roots the position is sometimes reversed. Often there are several scars on a single tree, both to root and stem. So far, we have found that less than 10% of these scars have infection clearly established, with the spruces showing the highest level of infection, Norway more than Sitka.

Infection is less on larch, and pine is seldom infected except in mature trees. Thuja and Tsuga, though infected worst of all, are less important and have not so far been specially examined. Stem wounds are on average larger than root wounds and also have a higher percentage of successful infections. Localised saprophytic decays, on the other hand, are more frequent on roots, probably due to the more favourable moisture conditions. Although larger wounds are more frequently infected, small and rapidly closing wounds may also become infected. No clear relationship is discernible between scar size and the rate of invasion away from the wound. Generally, rates of invasion are moderately slow. Pre-Commission plantings suggest that in older trees extension of rot is more rapid. Norway spruce, with the highest percentage of infection, also has the highest rate of invasion (again leaving out Thuja and Tsuga). Wounds which have deeper broken tissues have a higher percentage of infection than those formed by surface skinning.

The identification of fungi causing rot is not complete but Stereum sanguinolentum is the most important and has a good rate of invasion. Fomes annosus though showing the highest rate of invasion is much less frequent and Polyporus schweinitzii similarly so. It looks as if Armillaria may be a frequent wound invader on old hardwood sites, particularly through root wounds but the rate of decay appears to be slow. Coryne sarcoides has appeared in Sitka spruce but its importance is not known yet. Purely saprophytic decays are particularly common on roots and this appears sometimes to prevent healing over.

We have no very satisfactory protectant for application to wounds, which would in any case be rather impractical. Improvement in extraction techniques and better supervision, both in our own thinning and in contract sales, seems the best answer. Special care should certainly be taken in Thuja and Tsuga. A cautionary reminder is that creosote, or any other toxic substance applied to wounds, tends to damage the cambium, delay healing, and do more harm than good.

WINDBLOW SURVEY

The Survey was started in N. Wales, S. Wales and S.W. England Conservancies in January this year. From the returns already received it is apparent that there have been a series of gales during the winter each rather localised, and between them accounting for about 145 acres of windblow.

The main species affected were Sitka spruce 112 acres, P.C. 15 acres and D.F., N.S., C.P. and S.P. 18 acres combined, while a further 200 acres of 6 year old J.L., S.P. and L.C. were reported as having been seriously damaged. All the damage in the older crops has taken place in

trees more than 35 ft. tall, and it has been reported in crops as much as 90 ft. tall.

Many of the returns have not given the exact date of damage, as this is often difficult to assess, but from those given, it appears that the main gales were at the end of January in Mid Wales, in early February in S. Wales and S.W. England, in late February in Mid Wales and also in Scotland and finally late March in N. Wales. No later returns have been received, so that it can be assumed that the drier and less windy conditions in summer do not produce windblow.

It is hoped to continue and extend this survey in the near future, as the information received is proving very useful in studying the problem of windblow.

WINTER MOTH UNFAIR TO SITKA SPRUCE

The two commoner species of Winter moth, the Winter moth proper (Operophtera brumata) and the Northern Winter moth (Operophtera fagata) are well known pests of hardwoods. Their usual host plants are birch, oak, elm, beech, apple and hawthorn, but occasionally in the past we have had feeding reported on conifers when these trees have been underplanted beneath any of the above.

Never before, however, have these loopers bred up, as far as we know, without a good supply of their choice food adjacent. We, therefore, consider it very unfair to the S.S. at Rumster, near Wick, Caithness, that these moths changed their diet and fed and bred very happily on the spruce and heather. The heather seemed to support the higher population but, owing to a curious desire of the last stages of larvae to go up in the world, many of the heather feeders climb onto the spruce, via overhanging branches, and feed gregariously with their fellows on the spruce leaders. Result - dead leaders.

The history of this infestation goes back to 1959. Ten acres were then reported to be damaged, and the area affected had increased to 75 acres by 1960. This year infestation was general over the 1000 acres of the forest, though only the 75 acres was really suffering.

The degree of infestation was quite clearly correlated with site - the dense populations, and therefore damage, was always found on Sitka spruce on heather patches, whilst those on the wetter, grass-covered areas, bore much fewer larvae. The Sitka was obviously not very happy in the dryer spots in this low-rainfall district, and the relative success of P.C. on these sites accentuate the lesson.

The situation posed rather an interesting control-decision problem. In view of the fact that heather was heavily infested as well as Sitka, would it have been worthwhile to chemically control the population on the tree when re-infestation would be almost certain from the other host plant? Would it, in fact, have been worthwhile to embark on repeated spraying in order to save a young tree crop (which was not very well growing anyway)? Fortunately the decision did not have to be taken as a virus disease of the insects showed itself at the end of May. The disease was identified for us by the Virus Research Unit of the Agricultural Research Council at Cambridge, as a polyhedral gut inhabiting type. Viruses of this kind travel fast through a population, and, moreover, are usually carried over by the female adult in her ovaries, to the next generation. We should, therefore, see a natural control of the infestation this year or next, and we need not tamper with it ourselves now.

Rather interestingly, the Virus Research Unit were very pleased to see the Winter moth virus running rife under natural conditions. They had isolated a similar organism in the laboratory, but with this field evidence of a practical control, they will now probably offer it to Canada which has a considerable Winter moth problem.

Note

Both species of Winter moth are present at Rumster. Their typical life cycles are as follows:- Winter moth - adults on the wing Nov.-Dec., and eggs laid then, larvae feeding April on into beginning of June. Northern Winter moth - adults on the wing and eggs laid Oct.-Nov., larvae feeding May and June. Pupation in both cases when larvae are fully fed in the ground just below the surface.

BRANCH BREAK OF POPLARS

In bacterial canker assessments during May and June on poplar varietal trial sites, we noticed a curious breaking of young branches of poplar. This was seen on several sites and material showing similar damage has been sent here by Commission staff, but the most striking example was in the experimental area at Swanton Novers in N. Norfolk.

The general layout of poplar varietal trial areas consists of small plots of the several varieties concerned replicated over the area. Planting at Swanton Novers took place in 1949 and 1950. Standing at one end of the experiment it was clear that branch break was almost completely confined to certain of the plots, and in fact we found that only two of the poplar varieties, P. robusta and P. laevigata, were

affected. Both varieties had been defoliated by insect feeding but *P. robusta* was more affected by the branch break than *P. laevigata*. The incidence and degree of branch break was so consistent that it was possible to identify each of these varieties at a distance by this character.

Similar damage had been noticed before this in other poplar trial areas in East Anglia, but the incidence was scattered and there was no clear correlation between insect defoliation and branch break and an explanation was difficult to find. The evidence at Swanton Novers, with the defoliation/branch break association, tempted us to suggest that the large population of insects, probably larvae of leaf beetles or sawflies, attracted large insectivorous birds, such as rooks, or possible even pheasants, which caused the branch break during feeding. One critic of this theory has suggested that break is the result of feeding of a sawfly of the genus Cimbex. The scars formed on the bark by these insects undoubtedly produce regions of weakness across the stem, but the break cannot, we feel, be explained in terms of wind pressure acting about a point of weakness on the stem. Until further evidence to the contrary, the weight of large birds would appear to be the force producing branch break, whether or not breakage occurs at a point of weakness on the stem.

THE SPRINGTAILS JUMP AGAIN

In issue No. 26 we described damage occurring to young conifer seedlings due to epidemic numbers of flea-beetles and springtails, and attempts to control them with DDT. Later in the year (Entopath No. 27) serious distortions of seedlings was recorded from other nurseries, with Pinus contorta being the worst affected species. Large numbers of hopping creatures were noticed in some of these nurseries but they were not positively associated with the damage.

Observations have been carried out in various nurseries early this year and these have shown that springtails are able to do serious damage to young seedlings.

Springtail is the popular name given to members of the order Collembola. They are very small primitive creatures with no wings. They have large heads and a powerful springing device underneath which, when released, causes the animal to be shot into the air. They are usually dark in colour and prefer damp situations. They have biting mouthparts and develop from the egg by a simple or incomplete metamorphosis.

A species identified for us as Bowlettiella hortensis has this year caused damage to seedlings of a number of species including J.L. and P.C. The damage starts while the testas are still on the young plants but

growth has extended just enough to expose part of the cotyledons. Nibbling, sucking and mining cause wilting and distortion of the parts attacked, which may be the hypocotyl, or the cotyledons. The latter may sometimes all be pruned off. If the growing point is attacked, distortion or even death of the whole plant occurs. This damage often causes abnormal development of lateral shoots resulting in multi-headed and dwarfed seedlings.

Springtails are not as susceptible to DDT as are most insects, and populations have, in some instances, actually increased after application of DDT. In 1960 flea-beetles were effectively controlled by DDT but springtails were again doing damage in 1961 where DDT had been used in 1960. Aldrin has been tried but the most promising material appears to be Malathion. This is a very safe and non-residual insecticide and has given good results at the rate of $1\frac{1}{2}$ pints of Malathion 60 in 100 gallons of water per acre applied as a fine spray. Reports of damage, particularly of species affected and percentage of affected plants culled and of high numbers of these jumping creatures on seedbeds will be welcomed by the Entomologist.

FUNGICIDES OLD AND NEW

Bordeaux mixture against Botrytis

Despite many nursery experiments over the years in which inconclusive results were obtained using Bordeaux mixture (together with many other fungicides, including thiram), it has been made apparent to us that Bordeaux gives by far the most effective control of Botrytis. Alternative fungicides have been used against this fungus in horticulture and agriculture because of the sensitivity of the crops concerned to copper. Research workers in the Fungicides and Insecticide Section at Rothamsted Experimental Station assure us that both the fungicidal activity and the residual nature of Bordeaux mixture leaves other more modern fungicides standing. The new, less effective, fungicides have the attraction that they are easy to handle as, normally, mixing a powder with water is all that is required. It is pointed out however, that though more trouble to mix, the stickability of Bordeaux reduces the number of applications required compared with its younger competitors.

Acting on the advice of Rothamsted we advocate a 4/4/40 Bordeaux mixture for use against Botrytis on all conifers, none of which are copper sensitive, i.e. a mixture of 4 lbs. copper sulphate and 4 lbs. hydrated lime in 40 gallons of water. The copper sulphate should be dissolved in 5 gals. water and then added to 35 gals. of lime solution (prepared by first making a thin paste of the lime and then adding the rest of the water). The rate of application is 5 gals. of Bordeaux mixture per 100

sq. yds. It is probably best to spray Sequoia and Cupressus species as a routine, and other conifers when initial signs of Botrytis infection are noticed.

Bordeaux mixture can be bought ready mixed, but the best results are obtained from the freshly mixed solution. Whether mixed on the spot or bought ready mixed, it is extremely important to store the materials in airtight tins in a dry place.

Dithane against Lophodermium in nurseries

L. pinastri g. 28, 11

Again based on the results of other workers, this time on the Continent, we are recommending spraying against Lophodermium with Dithane, the active ingredient of which is zineb (see Entopath 27). Experiments have shown that Dithane gives significantly better results than copper-containing fungicides, including Bordeaux mixture.

Fairly recently, Dithane Wettable (a proprietary preparation containing 75% zineb) has come on to the market in this country. Although other zineb-containing fungicides are also available, we are initially confining our recommendation to Dithane.

Dithane Wettable can be obtained from Pan Britannica Industries Ltd., Britannica Works, Waltham Abbey, Essex. It is sold in 2, 10 and 110 lb. amounts, and the cost per lb. (per 10 lb. amount) is 9/6d. The dilution recommended against Lophodermium is 4 lbs. per 100 gals. applied at rate of 100 gals./acre. A wetting agent should be added, and for convenience in ordering, P.B.I. wetter (obtainable from the address above) is advocated. This is added to the spray solution at 8 fluid ozs. (240 ccs.) per 100 gals. P.B.I. wetter is sold in packs of twelve 16 fluid oz. bottles at £3 . 12s . 0d per pack.

The timing of fungicidal sprays against Lophodermium is a difficult decision, but generally three sprays, at the end of July, August and September respectively, should prove most effective.

